

FORM PTO-1390 (Modified)  
(REV 11-98)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371

K&W 305-WCG

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR

09/763679

INTERNATIONAL APPLICATION NO.  
PCT/EP99/06191

INTERNATIONAL FILING DATE  
24 August 1999 (24.08.99)

PRIORITY DATE CLAIMED  
2 September 1998 (02.09.98)

TITLE OF INVENTION

PACKAGING MATERIAL WITH A POLYOLEFIN FOAM LAYER

APPLICANT(S) FOR DO/EO/US

Ulrich REINERS and Michel PITTET

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
  - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☒ has been transmitted by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☐ A copy of the International Search Report (PCT/ISA/210).
8. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
  - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☐ have been transmitted by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☐ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☐ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 20 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☐ Certificate of Mailing by Express Mail
20. ☒ Other items or information:

A) Copy of cover sheet from published application WO 00/13886.

B) Copies of amendments made during international phase (amended sheets 1-3 of claims)

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR

09/763679

INTERNATIONAL APPLICATION NO.

PCT/EP99/06191

ATTORNEY'S DOCKET NUMBER

K&amp;W 305-WCG

21. The following fees are submitted:

**BASIC NATIONAL FEE ( 37 CFR 1.492 (a) (1) - (5) ) :**

- ☐ Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO ..... \$1,000.00
- ☒ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO ..... \$860.00
- ☐ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... \$710.00
- ☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... \$690.00
- ☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) ..... \$100.00

**ENTER APPROPRIATE BASIC FEE AMOUNT =****CALCULATIONS PTO USE ONLY****\$860.00**Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).**\$0.00**

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE
Total claims	20 - 20 =	0	x \$18.00
Independent claims	7 - 3 =	4	x \$80.00

**\$0.00****\$320.00**Multiple Dependent Claims (check if applicable). ☐**\$0.00****TOTAL OF ABOVE CALCULATIONS =****\$1,180.00**Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) (check if applicable). ☐**\$0.00****SUBTOTAL =****\$1,180.00**Processing fee of \$130.00 for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).**\$0.00****TOTAL NATIONAL FEE =****\$1,180.00**Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). ☐**\$0.00****TOTAL FEES ENCLOSED =****\$1,180.00****Amount to be:****refunded**

\$

**charged**

\$

☐ A check in the amount of \_\_\_\_\_ to cover the above fees is enclosed.

☒ Please charge my Deposit Account No. **14-1263** in the amount of **\$1,180.00** to cover the above fees.  
A duplicate copy of this sheet is enclosed.

☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **14-1263** A duplicate copy of this sheet is enclosed.

**NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.**

SEND ALL CORRESPONDENCE TO:

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REGISTRATION NUMBER

February 26, 2001

DATE

09/763679

JC02 Rec'd PCT/PTO 26 FEB 2001

Attorney Docket No. : K&W 305-WCG  
: CH8005US

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicant(s) : Ulrich REINERS and Michel PITTET  
PCT Application No.: PCT/EP99/06191  
Serial No. : To Be Assigned  
Filed : Herewith  
For : PACKAGING MATERIAL WITH A POLYOLEFIN FOAM  
LAYER  
Art Unit : To Be Assigned  
Examiner : To Be Assigned

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February 26, 2001

BOX PCT  
Hon. Assistant Commissioner For Patents  
Washington, D.C. 20231

**PRELIMINARY AMENDMENT**

Sir:

In advance of prosecution, kindly amend the above-identified application as follows  
and consider the following remarks:

**IN THE SPECIFICATION**

Prior to examination, please amend the above-identified application as follows:

### IN THE CLAIMS

Please cancel the previous version of the following claims and replace them with the following rewritten version. A marked up copy showing the amendment since the previous version is annexed as separate pages.

Claim 1 (amended). A multilayer film comprising the following sequence of layers:

- A) a basis layer of foamed propylene homopolymers, copolymer or mixtures thereof,
- B) a layer based on at least one of the polyolefins of the foam layer A),
- C) optionally a tie layer based on a polyolefin
- D) optionally an adhesive layer
- E) optionally a gas barrier layer, a flavortight barrier layer, or both,
- F) an adhesive layer,
- G) an optionally sealable or peelable surface layer,

whereby the total thickness of layers A) and B) ranges from 0.5 to 2 mm and the thickness of layer B) ranges from 1/6 to 1/2 of the thickness of layer A).

Claim 2 (amended). A multilayer film according to claim 1, wherein the total thickness of layers A) and B) ranges from 0.6 to 1.4 mm.

Claim 3 (amended). A multilayer film according to claim 1 wherein the thickness of layer B) ranges from 1/6 to 1/3 of the thickness of layer A).

Claim 4 (amended). A multilayer film according to Claim 1, wherein layer A) is made of a foamed mixture of polypropylene with long chain branching and a propylene-ethylene-blockcopolymer.

Claim 5 (amended). A multilayer film according to Claim 1, wherein layer B) is made of polypropylene or a propylene-ethylene-copolymer.

Claim 6 (amended). A multilayer film according to Claim 1, wherein layer C) is made of a polyolefin based on the monomer that is the main monomer of the polyolefins of foam layer A).

Claim 7 (amended). A multilayer film according to claim 6, wherein the polyolefin is polypropylene.

Claim 8 (amended). A multilayer film according to Claim 1, wherein layer E) is present and is made of ethylene-vinylalcohol copolymer.

Claim 9 (amended). A multilayer film according to Claim 1, wherein layer G) is made of a sealable polymer and optionally contains additives.

Claim 10 (amended). A multilayer film according to Claim 9, wherein layer G) is made of a low density polyethylene or an ionomer.

Claim 11 (amended). A multilayer film according to Claim 1, wherein layer G) is made of a peelable polymer and optionally contains additives.

Claim 12 (amended). A multilayer film according to Claim 11, wherein layer G) is made of a mixture of low density polyethylene and a polybutylene.

Claim 13 (amended). A multilayer film according to Claim 1, wherein the total thickness of layers C) to G) ranges from 20 to 70  $\mu\text{m}$ .

Claim 14 (amended). A multilayer film according to Claim 13, wherein the total thickness is 30 to 50  $\mu\text{m}$ .

Claim 15 (amended). A packaging material comprising the multilayer film of Claim 1.

Claim 16 (amended). A packaging item made of a film according to Claim 1.

Claim 17 (amended). A packaging tray made of a film according to Claim 1.

Claim 18. Cancel.

Claim 19 (amended). A method for packaging meat, sausage or cheese which comprises packaging said meat, sausage or cheese in a multilayer film according to Claim 1.

Claim 20 (amended). A method of packaging material on form-, fill- and sealing packaging machines which comprises packaging said material in a film of Claim 1.

Please add the following:

--Claim 21 (new). A food packaging container which comprises the multilayer film of Claim 1.--

REMARKS

This Preliminary Amendment is being filed to eliminate multiple dependency and to conform the claims to conventional format.

Favorable action is respectfully solicited.

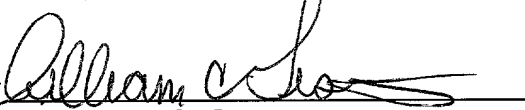
ADDITIONAL FEE

Please charge any insufficiency of fees, or credit any excess, to Deposit Account No. 14-1263.

Respectfully submitted,

NORRIS, McLAUGHLIN & MARCUS, P.A.

By

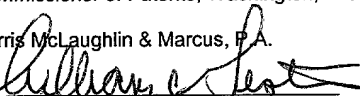
  
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Norris McLaughlin & Marcus, P.A.

By



Date:

2/26/01

MARKED-UP COPY OF AMENDED CLAIM,  
SHOWING CHANGES RELATIVE TO PREVIOUS VERSION

Claim 1 (amended). A multilayer film comprising the following sequence of layers:

- A) a basis layer of foamed propylene [homo- and/or] homopolymers, copolymer or mixtures thereof,
- B) a layer based on at least one of the polyolefins of the foam layer A),
- C) optionally a tie layer based on a polyolefin
- D) optionally an adhesive layer
- E) optionally a gas [-and/or] barrier layer, a flavortight barrier layer, or both,
- F) an adhesive layer,
- G) an optionally sealable or peelable surface layer,

whereby the total thickness of layers A) and B) ranges from 0.5 to 2 mm and the thickness of layer B) ranges from 1/6 to 1/2 of the thickness of layer A).

Claim 2 (amended). A multilayer film according to claim 1, [characterized in that] wherein the total thickness of layers A) and B) ranges from 0.6 to 1.4 mm.

Claim 3 (amended). A multilayer film according to claim 1 [or 2, characterized in that] wherein the thickness of layer B) ranges from 1/6 to 1/3 of the thickness of layer A).

Claim 4 (amended). A multilayer film according to [one or more of the claims 1 to 3,



characterized in that] Claim 1, wherein layer A) is made of a foamed mixture of polypropylene with long chain branching and a propylene-ethylene-blockcopolymer.

Claim 5 (amended). A multilayer film according to [one or more of the claims 1 to 4, characterized in that] Claim 1, wherein layer B) is made of polypropylene or a propylene-ethylene-copolymer.

Claim 6 (amended). A multilayer film according to [one or more of the claims 1 to 5, characterized in that] Claim 1, wherein layer C) is made of a polyolefin based on the monomer that is the main monomer of the polyolefins of foam layer A).

Claim 7 (amended). A multilayer film according to claim 6, [characterized in that] wherein the polyolefin is polypropylene.

Claim 8 (amended). A multilayer film according to [one or more of the claims 1 to 7, characterized in that] Claim 1, wherein layer E) is present and is made of ethylene-vinylalcohol copolymer.

Claim 9 (amended). A multilayer film according to [one or more of the claims 1 to 8, characterized in that] Claim 1, wherein layer G) is made of a sealable polymer and optionally contains [the known] additives.

Claim 10 (amended). A multilayer film according to Claim 9, [characterized in that] wherein layer G) is made of a low density polyethylene or an ionomer.

Claim 11 (amended). A multilayer film according to [one or more of the claims 1 to 10, characterized in that] Claim 1, wherein layer G) is made of a peelable polymer and optionally contains additives.

Claim 12 (amended). A multilayer film according to Claim 11, [characterized in that] wherein layer G) is made of a mixture of low density polyethylene and a polybutylene.

Claim 13 (amended). A multilayer film according to [one or more of the claims 1 to 12, characterized in that] Claim 1, wherein the total thickness of layers C) to G) ranges from 20 to 70  $\mu\text{m}$ .

Claim 14 (amended). A multilayer film according to Claim 13, [characterized in that] wherein the total thickness is 30 to 50  $\mu\text{m}$ .

Claim 15 (amended). [Use of the multilayer film according to one or more of claims 1 to 14 as] A packaging material comprising the multilayer film of Claim 1.

Claim 16 (amended). A [P] packaging item made of a film according to [claims 10 to 14] Claim 1.

Claim 17 (amended). A [P] packaging tray made of a film according to Claim 1.

Claim 18. Cancel.

Claim 19 (amended). [Packaging item according to claim 18] A method for packaging meat, sausage[,] or cheese which comprises packaging said meat, sausage or cheese in a multilayer film according to Claim 1.

Claim 20 (amended). [Use of a film according to one or more claims 1 to 14 as ] A method of packaging material on form-, fill- and sealing packaging machines which comprises packaging said material in a film of Claim 1.

--Claim 21 (new). A food packaging container which comprises the multilayer film of Claim 1.--

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09/763679  
JC02 Rec'd PCT/PTO 26 FEB 2001**Packaging Material With A Polyolefin Foam Layer**

The invention is in the field of packaging industry and relates to packaging material comprising a polyolefin foam layer having on one of its surfaces  
5 further layers.

Packaging materials with a foam layer of e. g. polypropylene in the form of quasi endless rolled webs are used for producing thermoformed self-supporting packaging items as e. g. trays for food. Therefore these kinds  
10 of packaging materials are formed on so called „form-fill-seal“ packaging machines („FFS-machines“) to packaging items. According to this method the web of packaging material is fed into the machine in which it is formed into a web of trays which trays in the same machine are filled and sealed with a preferable transparent sealing film. Then usually the trays are  
15 separated from each other.

In the known packaging materials the polypropylene foam layer is carrying on at least one of its surfaces further layers. Depending on the composition and the thickness of these layers these layers may also serve  
20 as further means for increasing the stiffness as well as protection of the foam layer surface or as gas and/or aroma barrier and/or as surface layer for bounding the packaging tray and a preferable transparent lidding film.

Packaging materials with a polypropylene foam layer for producing trays  
25 by thermoforming are disclosed e. g. in EP-A-0 570 222. These materials comprise a foam layer and a multilayer film which multilayer film may include a barrier layer rendering the packaging material gas- and/or aroma tight. The properties of this multilayer packaging material need some improvement as far as the use of this material as self-supporting  
30 packaging items is concerned.

Therefore it has been proposed to bond the foam sheet with the multilayer film by means of a bonding layer of a polyolefin based on the main monomer of the polyolefin of the foam layer (WO 96/25290). This

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results in an excellent adhesion between the laminate and the foam layer. However the packaging items especially self-supporting ones produced from this known multilayer film composition are not rigid enough for some applications.

5

Therefore there is a need to improve the stiffness of such packaging items, preferably trays, without increasing the thickness of the packaging material. Besides improving the mechanical properties of the packaging material there is also a demand to provide a packaging material suitable for thermoforming over a broader temperature range in order to achieve a faster production of packaging items.

10

According to the present invention, this object is achieved by providing a multilayer film comprising the following sequence of layers:

15

- A) a base layer of a polyolefin foam,
- B) a layer based on at least one polyolefin of the foam layer A),
- C) optionally a tie layer composed of a polyolefin, which is preferably based on the monomer that is the main monomer of the polyolefin of the foam layer A),
- D) optionally an adhesive layer,
- E) optionally a gas- and/or flavortight barrier layer,
- F) an adhesive layer,
- G) an optionally sealable and/or peelable surface layer,

20

whereby the total thickness of layers A) and B) ranges from 0,5 to 2 mm and the thickness of layer B) ranges from  $\frac{1}{6}$  to  $\frac{1}{2}$  of the thickness of layer A).

25

Preferably the total thickness of the layers A) and B) ranges from 0,6 to 1,4 mm and the thickness of layer B) is from  $\frac{1}{6}$  to  $\frac{1}{3}$  of the thickness of layer A).

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The foam layer A) consists of at least one foamed polyolefin. For producing packaging items such as trays applicable in food packaging foamed propylene- homo- and/or -copolymers are used advantageously as such materials are self-supporting with lower thickness and lower density. A mixture of polyolefins can also be used for the manufacture of the foam layer. A mixture of polypropylene with long chain branching (high-melt-strength polypropylene) and a propylene ethylene copolymer (e. g. heterophasic propylene ethylene blockcopolymer) can preferably be used. Particularly suitable is a mixture of a polypropylene with long chain branching and a melt-index (MFI) in the range of 1,4 to 4,2 g/10 min and a heterophasic propylene ethylene block copolymer in a mixing ratio of 1:1.

The polyolefin of layer A) can be foamed by addition of solid, liquid and/or gaseous blowing agents in known amounts preferable in an amount of 0,5 to 3 wt.%. The relevant disclosure of EP-A-0 570 222 is herewith cited as referential disclosure for the present application.

Foam layers of polyolefins, preferable of polypropylene, optionally admixed with copolymers of olefins, preferable with propylene ethylene copolymers, used for the production of packaging materials preferably have a density of 0,1 to 0,8 g/cm<sup>3</sup>, preferably 0,25 to 0,5 g/cm<sup>3</sup>, and a cell count of 75 to 300 cells per mm<sup>3</sup>. Density and cell count can be influenced by the process conditions like, e.g., extrusion temperature or other process condition during the preferred method for producing foam layers, namely by extrusion and expansion.

Layer B) of compact polyolefin essentially consists of a polyolefin of the foamed layer A). In case the basis layer A) is made of a foamed polypropylene or a foamed mixture of polypropylene and propylene ethylene copolymer the compact polyolefin layer B) is preferably made either of polypropylene or a propylene ethylene copolymer. Particularly preferred a heterophasic propylene ethylene blockcopolymer is used. The melt index (MFI) of the polyolefin used for the manufacture of layer B)

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ranges preferably from 1,8 to 5,5 g/10 min. The thickness of layer B) is  $\frac{1}{6}$  to  $\frac{1}{2}$ , most preferably  $\frac{1}{6}$  to  $\frac{1}{3}$  of the thickness of layer A).

5 Layer C) is present when layers D) to G) are pre-produced by coextrusion preferable by blown film coextrusion and to be combined with the other layers. Layer C) is based on a polyolefin which is preferably made from a monomer which is also the main monomer of the polyolefin of the foam layer A). In case layer A) consists of a foamed polypropylene and optionally a propylene ethylene copolymer, layer C) can be made of  
10 polypropylene optionally grafted with maleic acid anhydride. Copolymers of ethylene vinylacetate can also be used as materials for layers C). The thickness of layer C) ranges preferably from 5 to 25, most preferably from 8 to 15  $\mu\text{m}$ .

15 In case the inventive multilayer film should have a low gas permeability, i.e. a low permeability of oxygen and moisture and a high flavor tightness it comprises a barrier layer E). This barrier layer is preferably made of ethylene vinyl alcohol copolymer having an ethylene content of 32 to 45 Mol%, preferably 35 to 42 Mol%.

20 The barrier layer E) is bonded on its respective surfaces to the tie layer C) or to the surface protecting layer G) by means of an adhesive layer D) or F), respectively. The material used for this is preferably a propylene copolymer or a polyethylene grafted with maleic acid anhydride,  
25 respectively.

The surface protecting layer G) is preferably sealable or peelable. Thus, preferably low density polyethylene (LDPE) having a melt index (MFI) in the range of 0,5 to 8,0 g/10 min, preferably of 1 to 5 g/10 min (2,16 kg, 190°C measured according to ASTM D 1238) or a ionomer polymer like,  
30 e.g., a copolymer of an  $\alpha$ -olefin and an ethylenically unsaturated monomer with a carboxylic group, which are present in an amount of 20 to 100 % by weight as metal salt, preferably Zn-salt, or ethylene-vinylacetate

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copolymers with a vinylacetate content of 3 to 10 % by weight, preferably 4 to 6 % by weight is used for the manufacture of the sealable layer.

According to a particularly preferred embodiment the sealing layer is also peelable. The sealing layer then preferably comprises a mixture of LDPE and polybutylene (PB). To this end the mixture comprises 15 to 30 weight %, preferably 20 to 28 weight % of polybutylene. The melt index (MFI) of the polybutylene is preferably in the range of 0,3 to 2,0 g/10 min (190°C and 2,16 kg, ASTM 1238).

Preferably the thickness of the surface layer is in the range of 10 to 50 µm, preferably 15 to 30 µm.

When using LDPE as a sealing layer material and the inventive multilayer film comprises a barrier layer, usually an adhesive layer is required for connecting the barrier layer and the sealing layer, unless ethylene vinyl alcohol is used as material for the barrier layer. As adhesive material a polyolefin, preferably a polyethylene grafted with maleic acid anhydride may be used.

A LDPE and LLDPE mixture can also be used in a ratio from 3:1 to 4:1 as adhesive material. The thickness of the respective adhesive layer ranges from 2 to 8 µm, preferably from 3 to 6 µm.

The surface layer G) may contain usual and known lubricating agents and anti-blocking agents, as, for example, erucic acid amide, polyalkylsiloxane, such as for example polydimethyl siloxane and/or SiO<sub>2</sub>. All or individual layers can contain stabilizers and further additives of known kind.

Furthermore layer B) can contain 0,5 to 2 % by weight of a white pigment like, e.g., kaolin, calcium carbonate, talcum or titanium dioxide or mixtures thereof. These inorganic pigments are added to the polymer of which layer B) is made, preferably in form of a master batch containing 30 to 50 % by



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weight of pigments. Layer B) can also be composed of up to 30 % by weight of recycled inventive multilayer film material.

5 The multilayer film according to the invention is preferably produced by the usual blown film coextrusion or cast film coextrusion processes as far as the production of the sequence of layers C) to G) is concerned and preferably by an extrusion lamination step for combining with the polyolefin foam layer A). Thereby the foam layer A) and the multilayer film consisting of layers C) to G) are guided together in such a way that layer B) is  
10 extruded between them. Immediately after the extrusion a sufficiently high pressure is applied to the so produced laminate, so that layers A) to G) are sufficiently bonded to one another.

15 However it is also possible to produce the inventive multilayer films by coextrusion, whereby the foam layer A) is simultaneously coextruded with the other layers, optionally without layer C), and by expanding layer A).

20 The inventive multilayer films have an excellent thermoformability on so called FFS-machines (form-fill and sealing machines) and thus can be formed to packaging items preferable to trays by deep drawing. These trays can also be filled and sealed on the same machine. It was surprising to find out that the multilayer films according to the present invention cannot only be excellently processed on these FFS-machines but can also be formed to packaging items, particularly deep drawn trays with a higher  
25 speed when compared to known multilayer packaging materials.

The inventive multilayer films show an unexpected improvement of the mechanical properties such as resistance to breaking and stiffness of the E-modulus, although their total thickness is reduced compared to known  
30 comparable packaging materials. This considerable improvement is achieved without any increase of the thickness of the multilayer films which is being required as for the films known from the prior art. Surprisingly the mechanical properties are even improved although the total thickness of the multilayer packaging material is reduced.

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A further object of the invention is therefore the use of the multilayer film according to the present invention as packaging material, preferably on form-, fill- and sealing machines (FFS-machines) for packaging of food, especially for packaging of perishable food such as meat, ham or sliced  
5 meat. Because packaging on FFS-machines is very often carried out discontinuously in order to pack different goods, the packaging material must show a relatively broad so called thermoforming window in which the thermo-forming of the film can occur. This is achieved by providing the inventive packaging material, which has excellent thermo-formability,  
10 especially deep drawing qualities.

The thermo-formed, preferably deep-drawn, packaging items, such as, e.g., deep drawn trays, which can be produced from the multilayer materials according to the present invention can be sealed with known  
15 lidding film after they have been filled. Suitable lidding films are multilayer films, preferably from polyethylene terephthalate/SiO<sub>x</sub>/adhesive layer/low density polyethylene or from polyethylene terephthalate/adhesive layer/polyethylene/adhesive layer/ethylene vinyl alcohol copolymer/adhesive layer/polyethylene.

20 Of the above mentioned lidding films, the first-mentioned multilayer films are particularly suitable. Therefore the biaxially oriented polyethylene terephthalate is coated with SiO<sub>x</sub> by plasma vacuo technique. In a following step the prefabricated polyethylene film is laminated thereto with  
25 an adhesive. Such a lidding film is characterized by an excellent transparency and a high breaking resistance. The packaging items having such a lidding film show an excellent gas barrier property.

In the following examples the E-modulus is determined according to DIN  
30 43457 in the machine direction and transverse to this direction. Furthermore the elongation at break in the machine direction and transverse thereto is determined according to DIN 53455.

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Examples:

Example 1:

- 5 An inventive multilayer film is produced with the following sequence of layers:

- 10 Layer A) Foam layer with a density of  $0,3 \text{ g/cm}^3$  and a cell count of 120 cells per  $\text{mm}^3$  made of a 50:50 wt % mixture of a polypropylene with long chain branching (high melt strength polypropylene) and a heterophasic propylene ethylene blockcopolymer,
- 15 Layer B) consists of 100 % by weight of heterophasic propylene ethylene block copolymer like the one used for foam layer layer A),
- Layer C) consists of polypropylene,
- Layer D) consists of an adhesive based on polypropylene grafted with maleic acid anhydride,
- 20 Layer E) as a gas barrier layer consisting of an ethylene vinylalcohol copolymer,
- Layer F) as adhesive layer having the same composition as Layer D),
- Layer G) as a sealing layer based on low density polyethylene.

25 The multilayer film is produced by co-extrusion.

The thickness of the individual layers are set forth in table 1.

Table 1:

Layer	A)	B)	C)	D)	E)	F)	G)	Total
Thickness in $\mu\text{m}$	800	160	15	5	5	5	20	1010

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The mechanical properties of said film are set forth in table 3.

Comparative example:

- 5 A multilayer film having an identical layer sequence as well as identical layer compositions, but different thicknesses of layers is produced corresponding to the multilayer-film according to example 1.

10 The thickness of the individual layers of this multilayer film is set forth in table 2:

Table 2:

Layer	A)	B)	C)	D)	E)	F)	G)	Total
Thickness in $\mu\text{m}$	1160	40	15	5	5	5	20	1250

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The mechanical properties of this multilayer film are set forth in table 3:

Table 3:

		unit	ex. 1	comp. ex.
E-modulus	(machine direction)	$\text{N/mm}^2$	788	564
E-modulus	(transverse direction)	$\text{N/mm}^2$	584	426
Elongation at break	(machine direction)	$\text{N/mm}^2$	10,2	6,9
Elongation at break	(transverse direction)	$\text{N/mm}^2$	8,4	5,6

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As can be seen from table 3, the inventive multilayer films have far superior mechanical values, even though the total thickness of the film is less than of the known packaging materials. Therefore the inventive multilayer films are by far superior for the production of self-supporting packaging, particularly deep drawn trays.

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## Claims:

1. A multilayer film comprising the following sequence of layers:
- 5       A) a basis layer of polyolefin foam,  
      B) a layer based on at least one of the polyolefins of the foam layer A),  
      C) optionally a tie layer based on a polyolefin  
      D) optionally an adhesive layer,  
10       E) optionally a gas- and/or flavortight barrier layer,  
      F) an adhesive layer,  
      G) an optionally sealable or peelable surface layer,
- whereby the total thickness of layers A) and B) ranges from 0,5 to 2  
15       mm and the thickness of layer B) ranges from  $\frac{1}{6}$  to  $\frac{1}{2}$  of the thickness of layer A).
2. A multilayer film according to claim 1, characterized in that the total  
      thickness of layers A) and B) ranges from 0,6 to 1,4 mm.
- 20       3. A multilayer film according to claim 1 or 2, characterized in that the thickness of layer B) ranges from  $\frac{1}{6}$  to  $\frac{1}{3}$  of the thickness of layer A).
- 25       4. A multilayer film according to one or more of the claims 1 to 3, characterized in that layer A) is made of polypropylene or a mixture of polypropylene with long chain branching and a propylene-ethylene-blockcopolymer.
- 30       5. A multilayer film according to one or more of the claims 1 to 4, characterized in that layer B) is made of polypropylene or a propylene-ethylene-copolymer.

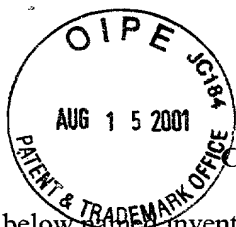
CH8005PCT

6. A multilayer film according to one or more of the claims 1 to 5, characterized in that layer C) is made of a polyolefin based on the monomer that is the main monomer of the polyolefins of foam layer A), preferably a polypropylene.
- 5 7. A multilayer film according to one or more of the claims 1 to 6, characterized in that layer E) is made of ethylene-vinylalcohol-copolymer.
- 10 8. A multilayer film according to one or more of the claims 1 to 7, characterized in that layer G) is made of a sealable polymer, preferably a low density polyethylene or an ionomer and optionally contains the known additives.
- 15 9. A multilayer film according to one or more of claims 1 to 8, characterized in that layer G) is made of a peelable polymer, preferably a mixture of low density polyethylene and a polybutylene and optionally contains the known additives.
- 20 10. A multilayer film according to one or more of claims 1 to 9, characterized in that the total thickness of layers C) to G) ranges from 20 to 70  $\mu\text{m}$ , preferably from 30 to 50  $\mu\text{m}$ .
- 25 11. Use of the multilayer film according to one or more of claims 1 to 10 as packaging material.
12. Packaging item, preferably trays, made of a film according to claims 1 to 10.
- 30 13. Packaging items according to claim 12 used for packaging food, preferable solid food.
14. Packaging items according to claim 13 for packaging meat, sausage, cheese.

CH8005PCT

15. Use of a film according to one or more claims 1 to 10 as packaging material on form, fill and sealing packaging machines.

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## COMBINATION DECLARATION &amp; POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name. I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

**PACKAGING MATERIAL WITH A POLYOLEFIN FOAM LAYER**

the specification of which was filed on August 24, 1999 as PCT/EP99/06191 and entered the U.S. National Stage on February 26, 2001 as application Serial No. 09/763,679.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed
<u>198 40 046.2</u> (Number)	<u>Germany</u> (Country)	<u>2 September 1998</u> (Day/Month/Yr. Filed)	<u>X</u> yes <u>  </u> no
<u>                    </u> (Number)	<u>                    </u> (Country)	<u>                    </u> (Day/Month/Yr. Filed)	<u>  </u> yes <u>  </u> no

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(Status)
		(patented,pending,abandoned)

(Application Serial No.)	(Filing Date)	(Status)
		(patented,pending,abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punished by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.





**POWER OF ATTORNEY** I, the named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

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